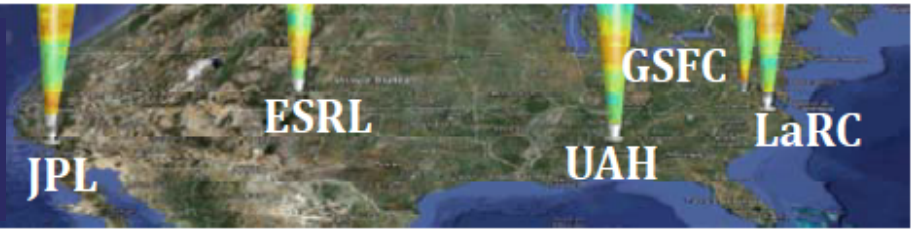
TOLNet Overview and Charge to the Group

Mike Newchurch

Motivation and Objectives



Motivation:

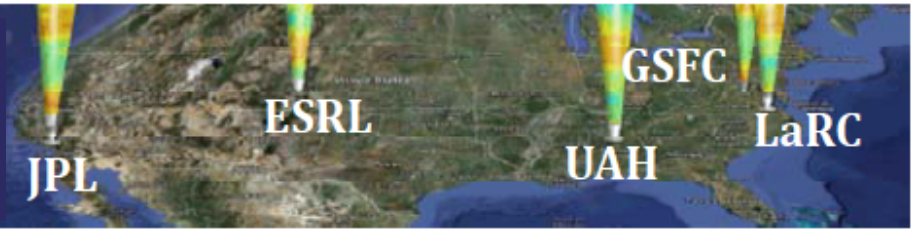
Prepare to make best use of next-generation satellite tropospheric ozone observations by advancing the understanding of processes driving the spatial and temporal variability of ozone throughout the troposphere

- **Synoptic processes** such as stratosphere-troposphere exchange, long-range pollution transport, and large-scale stagnation [timescale: days to several hours]
- **Mesoscale processes** such as diurnal land/water boundary cycles, low-level jets, and orographic venting [timescale: hours]
- **Local scale processes** including exchange between the boundary layer and the free troposphere, episodic precursor emissions, and convection [timescale: sub-hourly]

Objectives:

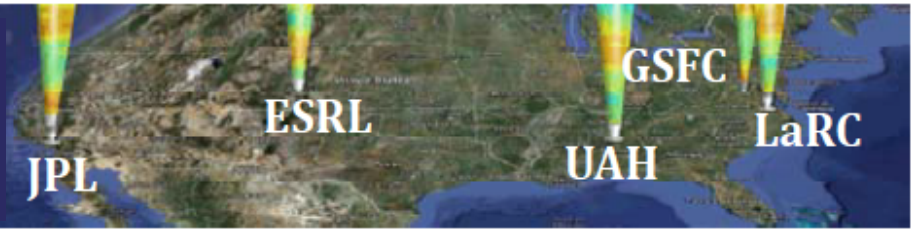
- Provide coordinated **high-resolution, time-height measurements of ozone** from near-surface to upper troposphere for air-quality/chemical/transport model improvement and satellite retrieval validation
- **Exploit synergies** with EVS-1 DISCOVER-AQ, EVI-1 TEMPO, GEO-CAPE studies, and existing routine observations to advance understanding of processes controlling regional air quality and chemistry
- Develop recommendations for **lowering the cost and improving the robustness** of ozone lidar systems to better enable their capability for addressing the needs of NASA, NOAA, EPA, and State/local AQ agencies

Accomplishments



- Established stable, well defined funding from NASA and NOAA with additional leverage
- Operated 5 lidars (3 mobile, 2 scanning) with **5-10% accuracy**, low minimum altitude, all measure PBL+, 3 measure UTLS, all with complementary instruments nearby.
- Participated in 8 field campaigns (6 by ESRL/CSD, 2 by GSFC & LaRC, 1 by UAH) including 3 lidars at BAO and at DISCOVER-AQ Colorado and single lidars in CA, CO, UT, TX, NV, MD, VA, and AL
- Demonstrated resiliency to overcome significant deployment difficulties (lightning strikes, chillers, etc.)
- Showed TOLNet scientific capability (e.g., Langford TOPAZ/HSRL/HRDL RL entrainment; Sullivan M/M STE morphology; Huang LES PBL development study; All PBL and FT laminar morphology; Sullivan, Langford, Senff, Kuang Sfc/PBL/FT/Strat laminar structure and disconnects including DAQ mandate col/sfc; and other studies
- Submitted 4 papers. Published 2 of those.
- Engaged in national-agenda discussions (NSF/ACCORD, CA/TOA, NASA/DS) and NASA TEMPO science team.
- Established guidelines to quantify standard vertical resolution, measurement uncertainties, and retrieval accuracy
- Engaged CARB in discussions of another campaign in CA 2016 or 17 and SPoRT as Early Adopter.
- Developed data file formats, scanner, calendar, and DOI.
- Established standard data protocol and public archive
  http://www-air.larc.nasa.gov/missions/TOLNet/

Charge to TOLNet



- Build on the considerable (outstanding? stunning?) TOLNet successes
- Publish scientific results: process studies, modeling studies, system performance – especially inter-TOLNet network studies.
- Refine the public presence and archive (more scientific results, easier data access, less latency, more collaborative activities)
- Finish quantifying the vertical resolution, measurement uncertainties, and measurement accuracy of all lidars (i.e., publish high-fidelity accuracy results)
- Develop an accurate vertical-profile UV-aerosol product.
- Participate in campaigns (i.e., design, build consensus, gain support, deploy)
- Continue operating and refining the systems
- Build resiliency (reliability, redundancy, spares, and creativity)
- Develop a design for a reliable, portable lidar